4.4 Air Quality

A. Methodology

This section describes the methodologies used to forecast and evaluate potential air quality impacts from the proposed project.

1. Conformity Applicability Test Methodology

In response to the Clean Air Act (42 U.S.C. § 7401 *et seq.*) amendments enacted in 1990, the US EPA promulgated regulations (40 CFR Parts 51 and 93) requiring federal actions to conform to the State Implementation Plan (SIP), described in Section 3.4. Each state then established procedures for evaluating the conformity of federal actions with the applicable SIP. In 1994, the Association of Bay Area Governments prepared the Federal General Conformity Regulation for incorporation into the San Francisco Bay Area's portion of the SIP. Because the Bay Area's portion of the SIP only regulates emissions of ozone and carbon monoxide, the Federal General Conformity Regulation applies only to direct and indirect emissions of ozone precursor pollutants (i.e., reactive organic gases (ROG) and nitrogen oxides (NOx)) and carbon monoxide (CO). The Regulation sets *de minimus* levels of 91 metric tons (100 tons) per year for each ozone precursor pollutant and carbon monoxide. Thus if a federal action, such as the adoption of the NASA Ames Development Plan (NADP), would result in emissions under 91 metric tons per year (100 tons per year), no further analysis would be required. If a federal action exceeds the *de minimus* levels, however, the agency proposing it is required to make a SIP conformity determination, as described below.

To evaluate the conformity of the NADP with the Bay Area's portion of the SIP, both direct and indirect emissions from the proposed action have been calculated. Emissions were predicted for three source types: 1) construction, 2) operational mobile sources (i.e., project-generated traffic), and 3) area sources (e.g., natural gas combustion for space and water heating).

a. Construction Emissions

Annual emissions of carbon monoxide and ozone precursor pollutants from construction activities are calculated to evaluate the applicability of General Conformity requirements to the project. There is not yet a construction schedule for implementation of the NADP, so the amount, type and duration of construction cannot be estimated. Instead, potential emissions from the construction of the proposed project must be calculated on the basis of project size.

General construction emission factors based on estimated development sizes are contained in the CEQA Air Quality Handbook that is published by the South Coast Air Quality Management District (SCAQMD CEQA Guidelines). Table 9-1 of the SCAQMD CEQA Guidelines lists screening level emission factors for estimating total construction emissions based on the type and size of the construction project. These factors account for all construction-related emissions, including diesel combustion from heavy-duty equipment, materials handling (i.e., truck traffic), and construction worker travel. When the screening emission factors for worker travel and materials handling are subtracted from the overall construction emission factors, it appears that emissions from heavy-duty construction equipment account for over 80 percent of the total construction period emissions of ROG, NOx and CO. Materials handling appears to account for 14 per cent of the construction period emissions, with worker travel generating only 6 per cent of the emissions. Screening emission factors from the SCAQMD CEQA Guidelines are shown in Table 4.4-1.

i. Emissions from Construction Equipment

When examined closely, the SCAQMD screening emission factors appear to have been developed from a number of sources that estimate emissions based on out-of-date methodologies and levels of emission control. Since 1987, controls have been adopted that substantially reduce emissions from heavy-duty compression ignited (or diesel) engines. In addition, EPA has recently developed the OFFROAD Model for estimating emissions from various off-road mobile sources, such as construction equipment. The California Air Resources Board (CARB) has modified the OFFROAD Model to reflect the effects of the new heavy-duty engine standards and reformulated diesel fuel. CARB has also recently updated the inventory of state-wide emissions to reflect

TABLE 4.4-1 **SCREENING FACTORS FOR ESTIMATING TOTAL CONSTRUCTION EMISSIONS**

	Total Emission Factors in Kilograms per 100m^2 (lbs per 1,000 ft^2) of Development		
Land Use Type	**ROG**	**CO**	**NOx**
Apartment/Housing	10.8 (22.0)	34.4 (70.2)	158.2 (322.9)
Hotel	20.4 (41.6)	65.1 (132.9)	299.4 (611.0)
Conference/Training	20.4 (41.6)	65.1 (132.9)	299.4 (611.0)
Museum/Exhibit Space	20.4 (41.6)	65.1 (132.9)	299.4 (611.0)
Office Park	27.1 (55.4)	86.8 (177.2)	399.2 (814.7)
Research & Development	27.1 (55.4)	86.8 (177.2)	399.2 (814.7)
Retail	15.6 (31.8)	49.8 (101.6)	228.8 (467.0)
University	23.0 (47.0)	73.6 (150.2)	338.3 (690.5)

Note: Table 9-3 indicates that material handling accounts for 14 percent of emissions.

Source: CEQA Air Quality Handbook, Table 9-1 (South Coast AQMD 1993).

the modified OFFROAD Model.[1] One of the refinements to the state emissions inventory was to update zero hour emission rates and include deterioration rates (increase in emission rates as equipment ages). These changes resulted in about an 8 percent increase to the overall off-road emission inventory for the baseline year (1990). Therefore, the heavy-duty construction equipment portion of the emission factors shown in Table 4.4-1 may be underestimated by 8 percent.

[1] *Notice of Public Meeting to Consider Approval of California's Emissions Inventory for Off-road Large Compression-ignited Engine ($ 25 HP)*, California Air Resources Board.

The refined OFFROAD model was used by CARB to update emission inventories for future years. Based on CARB's inventory projections,[2] as shown in Tables 4.4-2 and 4.4-3, the unit emission rate for construction equipment is decreasing considerably. For example, unit NOx emissions in the year 2000 are only 67 percent of 1990 emissions, and they are forecasted to decrease to 42 percent in 2010. This substantial decrease resulting from cleaner burning engines and reformulated fuels is not accounted for in the SCAQMD CEQA Guidelines.

ii. Emissions from Construction-Generated Truck Trips

As described above, the SCAQMD CEQA Guidelines say that materials handling (mostly truck deliveries) accounts for about 14 per cent of total construction emissions. CARB predicts that heavy-duty truck emissions will decrease substantially in the future. The forecasted change was obtained from the EMFAC7F model for 1990 and the MVEI7G model for years 2005 through 2015. It is assumed that material handling emissions were estimated using an emission factor model similar to EMFAC7F. This model predicted 1990 heavy-duty truck emissions that are about 8 percent lower than the more recent EMFAC7G emission factor model. Similar to the OFFROAD model, the MVEI7G model forecasts substantial decreases in heavy-duty truck emissions in the future. For example, unit NOx emissions in the year 2000 are 61 percent of 1990 emissions. They are forecasted to decrease to 45 percent in 2010. These substantial reductions are not accounted for in the SCAQMD CEQA Guidelines.

iii. Adjusted Screening Emission Factors

Illingworth & Rodkin, the air quality experts on the consultant team preparing this EIS, corrected the screening emission factors published in the SCAQMD CEQA Guidelines to more accurately predict emission from construction activities based on the refined numbers described above. Corrections included an increase of 8 percent to the baseline emission factors. Emission factors for

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[2] Personal communication with Debbie Futaba, California Air Resources Board Mobile Source Division, September 8, 2000.

TABLE 4.4-2 **CONSTRUCTION EQUIPMENT STATEWIDE EMISSION INVENTORY**

		Emissions in Metric Tons Per Day (Tons per Day) per Total Inventory			
Year	**Population**	**ROG**	**CO**	**NOx**	**PM_{10}**
1990	153,729	44.56 (49.12)	203.16 (223.94)	406.88 (448.50)	29.42 (32.43)
1995	161,089	39.74 (43.81)	165.85 (182.82)	353.76 (389.95)	24.30 (26.79)
2000	168,448	34.94 (38.51)	128.55 (141.70)	300.65 (331.41)	19.18 (21.14)
2005	180,482	29.87 (32.93)	109.08 (120.24)	267.80 (295.20)	17.67 (19.48)
2010	188,114	21.14 (23.30)	101.03 (111.37)	208.33 (229.64)	14.05 (15.49)
2015	193,493	15.35 (16.92)	96.88 (106.79)	154.08 (169.84)	10.90 (12.02)

future years were then adjusted by the factors shown in Table 4.4-4 . These factors take into account the benefits of reformulated diesel fuel, and the phase-in of newer cleaner heavy-duty diesel engines.

b. Mobile Sources

Emissions from mobile sources associated with operation of the proposed project were estimated using the MVEI7G model. This model was developed by CARB to calculate the mobile source inventory for the State. The BURDEN report for Santa Clara County, generated by the MVEI7G Model, was used to develop composite fleet emission rates. These rates were applied

TABLE 4.4-3 **CONSTRUCTION EQUIPMENT UNIT EMISSION RATES**

	Project Unit Emission Rate in Kilograms Per Day Based on Statewide Inventory			
Year	**ROG**	**CO**	**NOx**	**PM_{10}**
1990	0.29	1.32	2.65	0.19
1995	0.25	1.03	2.20	0.15
2000	0.21	0.76	1.78	0.11
2005	0.17	0.60	1.48	0.10
2010	0.11	0.54	1.11	0.07
2015	0.08	0.50	0.80	0.06

to the number of trips generated and forecasted vehicles miles traveled. Composite fleet emission rates were obtained for summer and winter seasons of the years 2005, 2010 and 2015.

Project trip generation data were developed by Fehr & Peers Associates, Inc. for weekdays, Saturdays, and Sundays. In a typical year, 65 percent of the trips were assumed for weekdays, 16 percent for Saturdays (including some holidays), and 19 percent were assumed for Sundays and major holidays.

The daily vehicle kilometers traveled was calculated by multiplying each trip by 11 kilometers (6.9 miles), which is the average trip length reported for Santa Clara.[3] Running exhaust and evaporative loss emissions (for ROG) were multiplied by the daily VMT. Start and trip end emissions, including "hot-

[3] Table 9, BAAQMD CEQA Guidelines 1996, revised 1999.

TABLE 4.4-4 **FACTORS TO ADJUST SCREENING CONSTRUCTION EMISSIONS FOR FUTURE YEARS**

	Adjustment Factors (Multipliers) to SCAQMD Construction Emission Factors			
Year	**ROG**	**CO**	**NOx**	**PM_{10}**
1990	1.08	1.08	1.08	1.08
1995	0.90	0.83	0.89	0.84
2000	0.72	0.59	0.72	0.60
2005	0.57	0.47	0.60	0.50
2010	0.40	0.43	0.46	0.39
2015	0.29	0.40	0.35	0.29

soak,"[4] were multiplied by the number of daily trips and calculated for both summer and winter conditions. The daily emission calculations were then converted to annual emissions, and are expressed in terms of metric tons per year.

Project trip generation data include the reductions from the proposed TDM program for Alternatives 2 through 5[5] as described in Chapter 2. These reductions take into account proposed on-site housing, the proximity of the project to light rail service, and shuttle service within the site and to Caltrain.

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[4] Emissions produced by the heat of the engine after an automobile is turned off.

[5] Memo from Barb Laurenson of Nelson/Nygaard Consulting Associates to Sorhab Rashid of Fehr & Peers Associates on January 5, 2001.

c. Operational Area Sources

Emissions associated with typical area sources were calculated using the methods developed by the Sacramento Metropolitan Air Quality Management District (SMAQMD 1995). This method estimates emissions from natural gas combustion for space and water heating. Emissions from each type of land use were calculated on the basis of square footages using the SMAQMD factors.

2. PM_{10} Emissions During Construction

Generation of dust leads to emissions of PM_{10} during construction. The Bay Area Air Quality Management District (BAAQMD) guidance for evaluating construction-generated air quality impacts emphasizes implementation of effective and comprehensive control measures rather than detailed quantification of construction PM_{10} emissions. The significance of dust related emissions for this project is based on the implementation of mitigation measures to prevent dust clouds from impacting sensitive receptors such as residences.

3. Miscellaneous Sources

Potential stationary sources of air pollutant emissions identified at this time include laboratory uses and a disaster training facility. At this time, design details are not available for either of these uses, so air pollutant emissions cannot be quantified. Such sources may be required to obtain permits from the BAAQMD. Under the BAAQMD CEQA Guidelines, stationary sources of air pollution that obtain permits or are exempt from permitting are not expected to result in significant air quality impacts.

4. Local Carbon Monoxide Analysis

To assess local air quality impacts, carbon monoxide (CO) concentrations were modeled at congested intersections substantially affected by the project. Total emission calculations indicate that project-related emissions of CO will exceed the General Conformity *de minimus* level of 91 metric tons per year (100 tons per year). Therefore, a conformity determination would be needed to address the potential for CO concentrations that violate the National Ambient Air

Quality Standards (NAAQS). This conformity determination is included in Appendix D.

Hot spot CO screening modeling was conducted for eight of the most congested intersections that would be affected by traffic from the proposed project. The screening procedure was based on the methodology recommended by the BAAQMD.[6]

At the Moffet Boulevard/R.T. Jones Road intersection, a more detailed study was warranted by the results of the screening and was therefore conducted. This refined modeling analysis used the CALINE4 model following the Transportation Project-Level Carbon Monoxide Protocol.[7] This protocol includes two screening level methods and a refined level of analysis.

In both the screening and the detailed analysis, the CALINE4 model was used to predict 8-hour CO concentrations for comparison to the NAAQS of 9 parts per million (ppm) and the CAAQS of 9.0 ppm. Emission factors were developed with the EMFAC7Fv1.1 model, using the vehicle mix representative of Santa Clara County traffic and wintertime operating conditions. Although this model has been updated, EPA and CARB still require use of EMFAC7v1.1 as part of the CO dispersion modeling for conformity determinations. Inputs to the CALINE4 model included meteorological conditions representative of worst-case conditions (wind speed of 1 meter per second, worst-case wind angle search, sigma theta of 10E, mixing height 1,000 meters, and atmospheric stability of category F). Traffic conditions (either peak-am or peak-pm) for the busiest hour were used. The model predicts a one-hour level that was converted to an 8-hour level using a persistence factor of 0.7. Background 8-hour concentrations were determined using 8-hour CO background concentrations reported in Figure 4 of the BAAQMD CEQA Guidelines. These concentrations were adjusted for future years using the rollback factors

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[6] BAAQMD *CEQA Guidlines*, 1996, revised 1999, pp. 36-46.

[7] University of California, Davis, 1997. *Transportation Project-Level Carbon Monoxide Protocol*. Institute of Transportation Studies. December.

contained in Table 13 of the CEQA Guidelines. Use of this method indicates background CO levels of 5.3 ppm in the year 2000 and 4.1 ppm for the year 2010 and beyond.

The total predicted 8-hour concentration was calculated by adding the modeled 8-hour CO level to the appropriate background 8-hour levels. Predicted concentrations are compared to the 8-hour CO NAAQS of 9 pm (or 9.4 ppm) to determine if the project conforms to the SIP. A predicted 8-hour CO concentration caused by the project that exceeded the California Ambient Air Quality Standard of 9.0 ppm would be considered a significant impact.

B. Standards of Significance

Project impacts would be considered significant if they would:

- Conflict with or obstruct implementation of the applicable air quality plan.
- Violate any air quality standard or contribute substantially to an existing or projected air quality violation. *A significant impact to local air quality is defined in this EIS as increased carbon monoxide concentrations at the closest sensitive receptors that cause a violation of the most stringent ambient standard for carbon monoxide (20 ppm for the one-hour averaging period, 9.0 ppm for the eight-hour averaging period).*
- Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors). *A significant impact on regional air quality is defined in this analysis as an increase in emissions of an ozone precursor or PM_{10} exceeding the BAAQMD recommended thresholds of significance. The latest guidelines issued by the BAAQMD for the evaluation of project air quality impacts consider emission increases to be significant if they exceed 36 kilograms per day (80 pounds per day or 15 tons/year) for ozone precursors or PM_{10}. Any proposed project that would*

individually have a significant air quality impact would also be considered to have a significant cumulative air quality impact.

— Expose sensitive receptors to substantial pollutant concentrations.

— Expose the General Public to significant levels of toxic air contaminants, defined as follows: 1) the probability of contracting cancer for the Maximally Exposed Individual (MEI) exceeds 10 in one million or 2) ground-level concentrations of non-carcinogenic toxic air contaminants would result in a hazard Index greater than 1 for the MEI.

— Create objectionable odors affecting a substantial number of people.

C. Impact Discussion

This section discusses potential air quality impacts that could be generated by the proposed project.

1. Regional Air Quality Planning

Air quality planning in the Bay Area is conducted to address both the Federal Clean Air Act and the State Clean Air Act. As described in Section 3.4, the State Implementation Plan (SIP) addresses the federally-enforceable Clean Air Act, and the Bay Area Clean Air Plan addresses the California Clean Air Act.

a. Conformity with the State Implementation Plan

Section 176(c) of the Clean Air Act Amendments requires Federal agencies to ensure that their actions conform to applicable plans for achieving and maintaining the National Ambient Air Quality Standards. The primary oversight responsibility for assuring conformity is assigned to the Federal agency.

NASA has calculated the annual emissions associated with the build out and operations of the NASA Ames Development Plan to evaluate the need for a conformity analysis. Emissions calculated included direct emissions from any new stationary sources, traffic generated by the project, area source emissions such as natural gas usage for space and water heating, and construction emissions. As noted in Chapter 2, NASA envisions a 10-year build-out period, beginning about 2003. During the build out phase, emissions would vary year to year depending on the amount of construction conducted and the rate of occupancy. Emissions associated with build out over a 10-year period are shown in Table 4.4-5. Calculations used to develop these emissions are contained in Technical Appendix D.

Calculations indicate that project-related emissions would exceed *de minimus* levels of carbon monoxide for Alternatives 2 through 5 under 10-year build out plans. Thus implementation of any of Alternatives 2 through 5 would require a SIP conformity determination for carbon monoxide.

As also shown in Table 4.4-5, emissions of nitrogen oxides or reactive organic gases would not exceed *de minimus* levels under Alternative 5, assuming it is constructed in a uniform manner over the 10-year period. However, generation of ozone precursors would be expected to exceed *de minimus* levels under Alternative 5 if the construction schedule were accelerated, and this would constitute a significant impact. Moreover, Alternatives 2, 3 and 4 would also require a conformity determination for ozone, since NO_x (an ozone precursor) emissions are predicted to exceed *de minimus* levels for those alternatives if constructed over a 10-year period.

Given that NASA's preferred alternative for the NADP is Mitigated Alternative 5 and that Mitigated Alternative 5 requires a conformity determination for carbon monoxide (but not for other pollutants), NASA has drafted a conformity determination, which is included in Appendix D. The conformity determination includes the following findings:

1. The Proposed Action is the build out of Mitigated Alternative 5 described in this Final EIS for the NASA Ames Development Plan.

TABLE 4.4-5 **MAXIMUM ANNUAL EMISSIONS ASSOCIATED WITH BUILD OUT OF THE NADP ALTERNATIVES**

	Maximum Annual Construction and Operational Emission in Metric Tons Per Year (in tons per year)*		
	10-Year Build out		
Description	**ROG**	**NOx**	**CO**
Alternative 1	Baseline Conditions		
Alternative 2	17 (19)	112 (123)	**363 (399)**
Alternative 3	14 (15)	95 (104)	**322 (354)**
Alternative 4	21 (23)	136 (149)	**439 (482)**
Alternative 5	13 (15)	83 (91)	**287 (315)**
Mitigated Alternative 5	17 (19)	99(109)	**380 (417)**
Mitigated Alternative 5 (11-Year Buildout)**	15(17)	91(100)	**356(390)**
de minimus levels	*91 (100)*	*91 (100)*	*91 (100)*

* Emissions calculated for Alternatives 2 through 5 do not include baseline emissions (i.e., Alternative 1).
** For detailed discussion of Mitigated Alternative 5, see Section 5.4.

2. The Proposed Action is located in the Bay Area Air Quality Management District (BAAQMD), which is designated by the EPA as a maintenance area for the national carbon monoxide standard.
3. The Proposed Action, built out over a period of 11 or more years, would result in maximum annual total direct and indirect emissions of carbon

monoxide that exceed 100 tons per year. These emissions exceed the de minimus amounts specified in the General Conformity Rule (40 CFR 51), thus requiring a conformity determination.

4. The air quality analysis described in Part D2 of Appendix D, conducted for the Proposed Action, indicates that predicted carbon monoxide concentrations associated with the project would not cause or contribute to any new violation of the National Ambient Air Quality Standard (NAAQS) for carbon monoxide or increase the frequency or severity of any existing violation of the carbon monoxide NAAQS. Results of the CO dispersion modeling are included in Table 4.4-9.

5. Pursuant to Section 176(c) of the Clean Air Act (42 U.S.C. 7476(c)), NASA has determined that implementation of the Proposed Action (Alternative 5) will conform to the Bay Area Air Quality Management District (BAAQMD) State Implementation Plan for Carbon Monoxide. The applicable state implementation plan for carbon monoxide is the Bay Area Redesignation Request and Maintenance Plan for the National Carbon Monoxide Standard, approved by the EPA on June 1, 1998.

b. Consistency with the 2000 Bay Area Clean Air Plan

Project consistency with the Bay Area Clean Air Plan is evaluated in two ways:

— Population, employment and increases in vehicle miles traveled are compared to the ABAG projections used to develop the Clean Air Plan.

— Proposed measures to reduce emissions from traffic are compared to the applicable Transportation Control Measures contained in the 2000 Clean Air Plan.

The 2000 Clean Air Plan uses population and employment projections contained in ABAG's Projections 1999.

Future population and employment resulting from build out of Alternatives 2 through 5, shown in Table 4.4-6, would consume a large percentage of the assumed employment growth for both Mountain View and Sunnyvale. This would likely lead to greater growth than projections used to develop the 2000

TABLE 4.4-6 **RESIDENTIAL POPULATION AND EMPLOYMENT PROJECTIONS COMPARISON**

	Projected Increase 2000-2015	
Study Area	**Employment**	**Residential Population**
Alternative 1	Baseline	Baseline
Alternative 2	13,068	2,009
Alternative 3	11,047	1,266
Alternative 4	15,599	2,577
Alternative 5	7,222	2,808
Mitigated Alternative 5	*7,088*	*4,909*
*Mountain View**	*9,680*	*11,300*
*Sunnyvale**	*15,710*	*15,800*

* Includes sphere of influence.
Note: Mountain View and Sunnyvale data for 2015 are based on ABAG projections.

Bay Area Clean Air Plan indicate. Projects or plans that result in higher population and employment projections than those developed by ABAG could lead to inaccuracies in attainment planning efforts. As a result, the project may interfere with BAAQMD, MTC and ABAG planning efforts to attain the State ozone standard. Alternative 1 represents baseline conditions, which are assumed in future projections made by ABAG.

The 2000 Clean Air Plan includes measures to reduce transportation-related emissions, which are referred to as transportation control measures or TCMs. The plan relies on many different agencies, cities and counties to successfully implement these measures. NASA's Transportation Demand Management

TABLE 4.4-7 **TRANSPORTATION CONTROL MEASURE OF BAAQMD AND NRP/BAY VIEW TDM POLICIES AND ACTIONS**

Clean Air Plan Transportation Control Measure	Clean Air Plan Description of Relevant Implementing Measures	NRP/Bay View Transportation Demand Management Action
#1 Support Voluntary Employer-Based Trip Reduction Programs	" Provide assistance to local and regional ridesharing organizations	" 4.1.10: On-site Car-share Program " 4.1.12: Vanpool Program " 4.1.13: Site-wide EcoPass, or other public transit subsidy " 4.1.14: Guaranteed Ride Home Program " 4.1.15: Marketing and Information of transportation alternatives " 5.2: Parking Supply (at least additional 20% reduction in parking from required standards)
#9 Improve Bicycle Access	" Improve and expand bicycle lane system " Develop and implement comprehensive bicycle plans " Provide bicycle access to facilities	" 4.1.7: Bicycle Path/Lane Network " 4.1.8: Bicycle Parking (rack and secure) " 4.1.9: Bicycle Promotional Programs " 4.1.11: On-site Bicycle Fleet " 4.2.1, 4.2.2, 4.2.3: Required Partner/Tenant Bicycle Conveniences
#12 Improve Arterial Traffic Management	" Improve arterials for bus operations and encourage bicycle and pedestrian use " Improve signal timing	" 3.3: The NRP Transportation Management Agency " 4.1.1: Shuttle Program " 4.1.16: Improved VTA Bus Service
#15 Local Plans, Policies and Programs	" Incorporate air quality beneficial policies and programs into planning and development activities	" 2.3: Minimize Traffic and Air Quality Impacts " 3.2: Project Phasing (TDM program will start at beginning of project) " 4.1.2: Preferential Parking for Carpools and Vanpools " 5.3: Parking Phasing " 5.2: Parking Supply (at least additional 20% reduction in parking)
#17 Conduct Demonstration Projects	" Promote demonstration projects to reduce motor vehicle emissions (e.g. low-emission vehicle fleets and fueling stations)	" 4.2.6: Electric Carts/Bikes Requirements for Service Fleets " 5.2 Parking Supply (at least additional 20% reduction in parking)

Clean Air Plan Transportation Control Measure	Clean Air Plan Description of Relevant Implementing Measures	NRP/Bay View Transportation Demand Management Action
#19 Pedestrian Travel	" Include policies to promote pedestrian travel " Promote development patterns that encourage walking " Include pedestrian capital improvement programs	" 4.1.3 On-site Housing " 4.1.4 On-site Retail and Open Space " 4.1.6: Pedestrian Path Network " 4.1.13: Site-wide EcoPass, or other public transit subsidy " 4.2.1, 4.2.2, 4.2.3: Required Partner/Tenant Pedestrian Friendly Orientation (site-wide networks, showers)
#20 Promote Traffic Calming Measures	" Include traffic calming strategies in capital improvements	" 2.2 Campus Urban Design Vision (roadway segments a maximum of two land width) " 4.1.6: Pedestrian Path Network " 4.1.7: Bicycle Path/Lane Network

Sources: 1997 Bay Area Clean Air Plan (updated in 2000) and NASA Research Park Draft TDM Plan, dated April 2001

Plan will considerably reduce trips. Table 4.4-7 identifies TCMs that the BAAQMD recommends for implementation by local jurisdictions, along with the corresponding measures contained in the draft TDM plan. As shown in Table 4.4-7 , the TDM plan incorporated into the NASA Ames Development Plan would be consistent with transportation control measures contained in the 2000 Bay Area Clean Air Plan.

2. Regional Air Pollutant Emissions

Regional air pollutant emissions associated with project operations include new stationary sources, changes in the use of motor vehicles (i.e., project-related traffic increases) and new area sources (i.e., emissions from space and water heating) associated with the NASA Ames Development Plan. The NADP is not expected to result in increases to aircraft operations at the airfield, so there would be no changes to aircraft air pollutant emissions.

The key regional air pollutants analyzed in this EIS are ozone precursors and small particulate matter (PM_{10}). Emissions of these air pollutants were predicted for two different years, with the following assumptions:

- 2010: Approximately 75 percent buildout.
- 2015: 100 percent buildout.

Calculations used to develop these emissions are contained in Technical Appendix D. As shown in Table 4.4-8 , vehicle and area source air pollutant emissions of NOx and PM_{10} associated with Alternatives 2 through 5 would exceed the significance thresholds established by the BAAQMD for at least one of these pollutants.

Alternative 4 would result in the highest emission levels, while Alternative 5 (the Preferred Alternative) would result in the lowest levels.

3. Carbon Monoxide Concentrations

Carbon monoxide modeling is recommended under the BAAQMD CEQA Guidelines for projects or plans that generate over 250 kilograms or 550 pounds

TABLE 4.4-8 **AIR POLLUTANT EMISSIONS ASSOCIATED WITH PROJECT OPERATION**

Air Pollutant Emissions in Kilograms per Day ***(pounds per day)***

Project Alternative	2010 (~75% Build out)			2015 (~100% Build out)		
	ROG	**NO_x**	**PM_{10}**	**ROG**	**NO_x**	**PM_{10}**
Alternative 1	Baseline Conditions			Baseline Conditions		
Alternative 2	39 (86)	114 (253)	49 (108)	35 (77)	135 (299)	65 (144)
Alternative 3	28 (63)	85 (189)	36 (79)	26 (57)	101 (224)	47 (105)
Alternative 4	48 (107)	138 (307)	60 (133)	43 (96)	163 (363)	80 (177)
Alternative 5	28 (62)	87 (193)	34 (76)	25 (56)	104 (230)	47 (101)
Mitigated Alternative 5*	37 (82)	113(250)	46(102)	38(85)	135(299)	62 (137)
BAAQMD Thresholds	36 (80)	36 (80)	36 (80)	36 (80)	36 (80)	29.8 (80)

* For details, see Section 5.4

per day and affect traffic at intersections. Furthermore, lead federal agencies under the General Conformity Rules (40 CFR Parts 51 and 93) must make a SIP conformity determination for carbon monoxide when project emissions are predicted to exceed 91 metric tons per year (100 tons per year). The SIP Conformity Determination includes an analysis that indicates whether or not the project would cause or contribute to a violation of the National Ambient Air Quality Standard for carbon monoxide. Since project-generated traffic would result in large quantities of carbon monoxide (i.e., over 250 kilograms per day or 91 metric tons per year), and would affect congested or potentially-congested intersections, carbon monoxide concentrations were modeled. The modeled concentration was added to background levels to predict total future concentrations. This prediction method assumes worst-case meteorological conditions during winter when carbon monoxide levels are highest (i.e., very light winds, cold temperatures and stable atmospheric conditions). Predicted concentrations, shown in Table 4.4-9, were compared to State and federal standards. Since the 8-hour carbon monoxide standard is the most stringent, that standard was used to evaluate the significance of changes to carbon monoxide levels. The analysis was based on unmitigated traffic conditions.

Carbon monoxide concentrations are typically highest in the evening periods, especially near large sources of automobile trips. This is due to a combination of factors that include higher traffic volumes, meteorological conditions, and emissions from traffic combining with wood smoke. In addition, a higher percentage of commuter vehicles near NASA are in what is referred to as "cold-start" mode where carbon monoxide emissions are considerably higher. After these vehicles have been operating for a few minutes, carbon monoxide emissions decrease. Carbon monoxide emissions are higher during cold-start mode, since cold fuel is not efficiently combusted and catalytic converters in the exhaust line must heat up to reduce emissions effectively.

Carbon monoxide levels at many of the off-site intersections in the area would not change much due to the project. Results of the model indicate that carbon monoxide concentrations would remain below State and federal standards for all alternatives. Under Alternative 4, carbon monoxide concentrations near the intersections of Moffett-Clark and the Moffett Extension would be the highest. Concentrations were modeled to be 8.6 parts per million in the PM period under worst-case meteorological conditions. Violations of either federal or state standards for local carbon monoxide concentrations are not predicted under any of the project alternatives; therefore, the impact would be less than significant under those alternatives. The project would conform to the San Francisco Bay Area Maintenance Plan for the National Carbon Monoxide Standard (the approved SIP, BAAQMD 1994) since violations of the carbon monoxide ambient air quality standards are not predicted.

TABLE 4.4-9 **WORST-CASE PREDICTED CARBON MONOXIDE CONCENTRATIONS (PARTS PER MILLION)**

	Alt 1		Alt 2		Alt 3		Alt 4		Alt 5	
Intersection	1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.	1-Hr.	8-Hr.
Middlefield and Shoreline	13	8.3	13	8.3	13	8.3	13	8.3	13	8.3
Moffett and Central Expwy.	12	7.3	12	7.4	12	7.4	12	7.4	12	7.3
Moffett and Middlefield	12	7.4	12	7.7	12	7.7	12	7.8	12	7.6
Moffett-Clark and R.T. Jones Rd	10	6.2	12	7.6	12	7.9	13	8.6	12	7.4
Ellis and Middlefield	13	8.0	13	8.3	13	8.4	13	8.4	13	8.2
Ellis and Manilla	9	5.4	10	6.1	10	6.1	10	6.2	9	5.7
SR-237 WB ramps and Mathilda	13	8.4	13	8.6	13	8.6	14	8.7	13	8.4
Manilla-Moffett Park and Mathilda	13	8.3	13	8.5	13	8.4	13	8.5	13	8.3

State 1-hour standard is 20 ppm and federal 1-hour standard is 35 ppm.
State 8-hour standard is 9.0 ppm and federal 8-hour standard is 9 pm.
Note: Results do not include effects of traffic mitigation measures.

4. Toxic Emissions

This section describes potential toxic emissions from laboratory facilities constructed under the NADP and from the Regional Plume, described in Section 3.7, above.

a. Laboratories

The NADP would include new laboratory facilities. Small amounts of gasses considered toxic or hazardous may be used within these facilities, but specific types and quantities cannot be identified at this time. Storage of toxic gases is regulated by the Santa Clara County Health Department. The BAAQMD regulates emissions of toxic air contaminants and has determined that sources of these emissions that comply with all applicable regulations will generally not be considered to have an adverse significant impact to air quality. The BAAQMD reviewed health risk assessments prepared for university and commercial laboratories and found that teaching and commercial laboratories smaller than 2,300 square meters (25,000 square feet) in floor size with fewer than 50 fume hoods do not present an adverse significant health risk to the public, provided that responsible laboratory management practices are in place. As a result, the BAAQMD exempts these types of emissions from their permitting requirements (Regulation 2, Rule 1, Section 2.11 and Section 2.12). At this point, laboratories greater than 2,323 square meters (25,000 square feet) in size have not been identified under any of the alternatives, so significant toxic air contaminant emissions are not anticipated under the NADP. If larger labs are planned in the future, they would be subject to BAAQMD permit requirements and possible controls to ensure insignificant emissions.

b. Regional Plume

A Regional Plume of contaminated groundwater underlies a portion of Ames Research Center. The contamination was caused mostly by the semiconductor manufacturing and metal finishing activities of facilities across Highway 101. The Regional Plume also contains contaminants from past operations at the former Naval Air Station and NASA. The Regional Plume includes various chemicals, particularly chlorinated solvents (refer to Figure 3.7-1 in Section 3.7, Hazardous Materials and Site Contamination).

From 1999 to 2001, indoor air testing was conducted at many NASA buildings due to concern that buildings situated over the Regional Plume in the NRP area could be exposed to elevated levels of these contaminants.[8] The primary concern was that vapor-phase contaminants associated with the Plume could migrate through the soils into buildings. NASA requested measurements of volatile organic air contaminants in Hangar 1 and Buildings 6, 21, 22, 26, 111, 148, 156 and N-269 using EPA Sampling and Analysis Method TO-14. This method is used to measure very low levels of toxic contaminants in air. It involves the collection of air samples in specially designed canisters and subsequent analysis using gas chromatography/mass spectrometry with selective ion monitoring techniques.

Target compounds were identified through the results of groundwater testing. Each air sample collected was analyzed for 26 different volatile organic compounds, which included trichloroethylene, benzene, chloromethane, 1,2-dichloroethane, and vinyl chloride. A summary of the initial testing results is shown in Table 4.4-10. The testing results were compared against acceptable workplace standards, adjusted EPA Region 9 Preliminary Remediation Goal (adjusted for 24-hour per day exposure over 20 years), and EPA countywide average ambient air quality data. All measurements, including ambient air, found benzene concentrations above EPA preliminary remediation goals but well below OSHA's permissible exposure levels (PEL). These benzene concentrations were similar to concentrations measured by the BAAQMD in Mountain View and are considered to be characteristic of ambient air in the region. Motor vehicles are a major source of benzene emissions in the Bay Area. Concentrations of up to six different chlorinated hydrocarbons were detected above adjusted preliminary remediation goals (PRG) at five of the nine buildings tested. One other volatile organic compound, 1,4-dioxane, was detected above the PRG in all buildings that were tested except Building 111.

[8] NASA Ames Research Center. *Indoor Air Testing Report for Hangar 1 and Buildings 6, 21, 22, 26, 111, 148, 156 and N-269,* January 2000. Prepared by Science Applications International Corporation.

TABLE 4.4-10 SUMMARY OF VOC CONCENTRATION (IN PPBV) MEASURED DURING INDOOR AND AMBIENT AIR TESTING PROGRAM

VOC Analyte	Buildings																	Reference Values		
	Hanger 1	Bldg. 6	Bldg. 21	Bldg. 22	Bldg. 26	Bldg. 111	Bldg. 148	Bldg. 156	Bldg. N-269	Bldg. 555	Bldg. 583C	Bldg. 15	Bldg. 2	Bldg. 566	Bldg. 543	Bldg. 476	Ambient Samples	OSHA PEL	EPA PRG	EPA CEP
Trichloroethylene	**n.d.-1.0**	**0.08-1.1**	0.13-0.47	0.052	n.d.	n.d.-0.041	**n.d.-1.5**	**n.d.-0.84**	n.d.	0.08-0.10	n.d.	0.08-0.10	0.09-0.14	**n.d.-1.8**	n.d.	n.d.	n.d.	25,000	0.72	0.23
Perchloroethylene	0.48	0.069-0.27	0.06-0.07	0.098	0.13-0.34	0.48	0.052-0.07	0.07-0.23	0.045-0.07	n.d.-0.10	n.d.-0.11	0.30-0.43	0.13-1.1	n.d.-0.72	n.d.	n.d.-0.15	0.05	25,000	1.70	0.13
cis-1,2-Dichloroethene	n.d.-6.7	0.12-2.9	0.1-0.43	0.083	n.d.	n.d.-0.075	n.d.-0.27	n.d.-0.31	n.d.-0.22	n.d.-0.21	n.d.	n.d.-0.12	n.d.-0.09	n.d.	n.d.	n.d.	n.d.-0.26	200,000	32.20	n/a
trans-1,2-Dichloroethene	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.-0.64	n.d.	n.d.	n.d.	200,000	64.40	n/a
Vinyl chloride	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	1,000	0.03	n/a
Benzene	**n.d.-1.0**	**0.46-1.1**	**0.44-0.7**	**0.5**	**0.45-0.81**	**0.48-0.62**	**0.27**	**0.63-1.6**	**0.26-0.49**	0.22-0.25	0.14-0.17	**0.20-0.30**	0.16-0.21	**0.5-1.1**	**0.18-0.71**	0.12-0.21	**1.10**	1,000	0.25	**0.79**
Chloromethane	n.d-0.8	**n.d.-4.9**	n.d.-1.1	0.44	n.d.-0.88	n.d.-0.8	n.d.-1	n.d.-1.6	n.d.-0.78	0.60	0.56-0.82	0.57-0.89	0.56-0.79	n.d.-3.5	n.d.	n.d.	0.26	50,000	1.81	0.60
Bromomethane	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.08	0.11-0.13	0.11-0.13	0.09-0.12	n.d.-0.33	n.d.	n.d.-0.15	n.d.	5,000	4.69	0.01
1,1-Dichloroethene	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	--	n.d.	n.d.	n.d.	n/a	0.03	n/a
Methylene Chloride	n.d.-0.52	n.d.-1.2	0.48-2.6	2.2	n.d.-0.27	n.d.	n.d.-0.98	0.12-0.75	n.d.-0.7	0.20-0.21	0.19-0.22	0.21-0.22	0.26-0.84	n.d.-0.79	0.13-0.24	0.22-0.37	n.d.-1.2	500,000	4.11	0.23
1,2-Dichloroethane	**n.d.-0.076**	**n.d.-1.5**	n.d.	n.d.	n.d.	n.d.	n.d.	**n.d.-0.1**	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n/a	0.06	0.02
1,1,2-Trichloroethane	n.d.	**n.d.-0.21**	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	--	n.d.	n.d.	n.d.	10,000	0.08	0.00

TABLE 4.4-10 SUMMARY OF VOC CONCENTRATION (IN PPBV) MEASURED DURING INDOOR AND AMBIENT AIR TESTING PROGRAM

VOC Analyte	Buildings																	Reference Values		
	Hanger 1	Bldg. 6	Bldg. 21	Bldg. 22	Bldg. 26	Bldg. 111	Bldg. 148	Bldg. 156	Bldg. N-269	Bldg. 555	Bldg. 583C	Bldg. 15	Bldg. 2	Bldg. 566	Bldg. 543	Bldg. 476	Ambient Samples	OSHA PEL	EPA PRG	EPA CEP
Chlorobenzene	n.d.-0.47	**n.d.-16**	n.d.-0.071	n.d.	n.d.-0.22	0.07-0.1	n.d.-0.53	n.d.-0.26	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.-0.16	n.d.	n.d.	n.d.	n/a	15.87	0.02
1,3,5- Trimethyl-benzene	n.d.-0.20	n.d.-0.39	n.d.-0.43	n.d.	n.d.	n.d.	n.d.	n.d.-0.93	n.d.-0.044	n.d.-0.08	n.d.	n.d.-0.09	n.d.	n.d.-0.21	n.d.-0.44	n.d.	0.04-0.05	25,000	4.42	n/a
1,2,4- Trimethyl-benzene	n.d.-0.11	n.d.-0.62	0.198	0.082	0.06-0.13	n.d.-0.13	n.d.-0.22	n.d.-2.2	n.d.-0.1	0.22-0.28	0.092-0.095	0.20-0.36	0.15-0.17	n.d.-1.0	n.d.-1.5	n.d.-0.24	n.d.-0.043	n/a	4.42	n/a
1,3-Dichlorobenzene	n.d.	n.d.-0.049	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	--	n.d.	n.d.	n.d.	n/a	4.89	n/a
1,4-Dichlorobenzene	n.d.-0.09	n.d.-0.06	**0.07-0.25**	n.d.	n.d.-0.054	n.d.-0.047	n.d.-0.16	**0.15-7.9**	n.d.-0.052	n.d.	n.d.	n.d.	n.d.	**n.d.-1.7**	n.d.-0.15	**n.d.-0.17**	n.d.-0.05	75,000	0.16	0.02
Chlorotoluene	n.d.	n.d.	n.d.	n..d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	50,000	49.35	n/a
1,4-Dioxane	**n.d.-11**	**n.d.-5.4**	**n.d.-5.9**	**0.71**	**n.d.-4**	n.d.-0.23	**n.d.-7.6**	**n.d.-21**	**0.22-10**	**n.d.**	**n.d.-2.5**	**0.59-1.1**	**0.46-1.0**	**n.d.-7.1**	**0.66-4.5**	**0.5-5.5**	**n.d.-0.83**	100,000	0.59	n/a

Notes: ppbv = parts per billion by volume
OSHA PELS: Occupational Safely and Health Administration Permissible Exposure Limits
Adjusted EPA PRGs: U.S. EPA Region 9 Preliminary Remediation Goals, adjusted for exposure period of 24 hours/day over 20 years
EPA CEP: County-wide average ambient air concentrations as modeled during EPA's Cumulative Exposure Project
n.d: not detected. **Bold and highlighted** values exceed the Adjusted EPA PRG guidelines
* Ambient samples collected at Buildings 6, 26, 148, N-269, 566, 583 and 583C.

Source: SAIC, 2000.

A similar indoor air testing program was conducted for Building 566 by SAIC.[9] Phase 1 of the testing program was developed based on results of a passive gas monitoring survey that identified, but did not quantify, the presence of chlorinated hydrocarbons. Phase 2 used results of Phase 1 to focus on specific rooms within the building. This program also measured elevated benzene levels indoors that were similar to ambient concentrations. These benzene levels were below the adjusted PRG levels, with the exception of one sample that was suspected to be an outlier. Two chlorinated hydrocarbon compounds, 1,4-Dichlorobenzene and trans 1,3-Dichloropropene, were found at levels that exceed their respective adjusted PRGs. Both detections were from one of many samples and were not confirmed through duplicate sample collections. The only other volatile organic compound found at levels above the adjusted PRG was 1,4-Dioxane. This compound was found in a majority of the 19 indoor samples and exceeded the adjusted PRG in two of those samples (Rooms 110 and 111). The report suggested further testing for some of the compounds to more definitively resolve remaining air quality concerns regarding the use of Building 566.

In May of 2000, Harding and Lawson Associates, under contract to NASA, conducted another similar indoor air quality testing program for volatile organic compounds at Buildings 476 and 543.[10] Benzene was detected in both indoor and outdoor samples of both buildings, but levels were below the adjusted PRGs. Similar to other measurement programs, 1,4-Dioxane was detected in all samples. Measured concentrations of 1,4-Dioxane exceeded the adjusted PRGs at both buildings as well as in the ambient air. These levels were well below worker permissible exposure limits. The report recommended further testing to quantify these levels and that restriction on the usage of these

[9] NASA Ames Research Center. *Indoor Air Testing Program Report for Building 566*. December 1999. Prepared by Science Applications International Corporation.

[10] *Indoor Air Quality Investigation Buildings 476 and 543 NASA Ames Research Center*. December 2000. Prepared by Harding ESE, Inc.

buildings for dormitory uses be considered until the source can be located or managed.

In August 2001, Harding ESE collected another set of indoor air samples from Buildings 555, 583C, 15 and 2 and outdoor ambient air samples near these buildings. Results were similar to previous measurements. Overall, levels were slightly lower than previous measurements. Concentrations of 1,4-Dioxane were found to be above the adjusted PRG in all buildings except Building 555.

Maximum concentrations of some of the volatile organic compounds exceeded adjusted PRG, at many of the buildings tested. Results of these studies indicate that all maximum concentrations of volatile organic compounds were below OSHA permissible exposure levels for workers.

The testing results are not conclusive, but they do indicate that without proper remediation or new building design, residential uses located over the highly contaminated areas of the Regional Plume could be exposed to potentially significant levels of toxic air contaminants that are suspected to be emitted from contaminated groundwater and soils. This would be a potentially significant impact if long-term residential uses were to be developed over areas of the Regional Plume with high concentrations of contaminants. However, current plans do not indicate any residential use over highly concentrated areas of the Regional Plume. Student apartments and dormitories are planned on the western edge of the Regional Plume and conference and training lodging is planned to be located over highly concentrated areas. This could cause significant impacts.

Additionally, an Environmental Issues Management Plan (EIMP) has been developed for the project. This plan addresses construction techniques and minimum design requirements for new development located over the Regional Plume to reduce the potential for elevated toxic contaminant levels inside buildings.

c. Exposure to Background Toxic Air Contaminants

The project would not only have the potential to expose people to toxic air contaminants from on-site sources; it would also expose new residents, students and employees to toxic air contaminants that exist in the ambient air in the South Bay region. Monitoring conducted by CARB and BAAQMD reveal that background levels of several toxic air contaminants in many parts of the South Bay exceed acceptable risk levels. New residents, students and employees would be exposed to these background levels of contamination if they live, work or study at the ARC. However, this same exposure already occurs throughout the South Bay, and construction of facilities similar to those proposed under the NADP anywhere in the region would have the same impacts. Therefore, this impact is not considered significant.

d. Cumulative Impacts Related to Toxic Air Contaminants

Development under the NADP would also combine with other projects in the region to increase exposure to toxic air contaminants. NADP and cumulative projects would all lead to increased vehicular traffic, which would increase toxic air contaminant levels. Additionally, both the NADP and cumulative projects would bring additional people to the region, where existing levels of toxic air contaminants already exceed acceptable risk levels, thereby exposing these people to these toxic air contaminants.

5. Construction Emissions

Construction associated with the NADP is anticipated to occur in phases over a 10-year period. No specific construction schedules or plans are available at this time. Construction activities are a source of particulate matter and gaseous emissions during much of the construction period. The pollutants of greatest concern from construction activities are NO_x and PM_{10}. The main sources of PM_{10} emissions would be dust generated from site grading and other disturbance of soil. Other sources of construction-related emissions include exhaust emissions from gasoline or diesel powered construction equipment, solvents in construction materials, and gases emitted from asphalt for a short period of time after paving occurs.

Disturbance to dry soils by graders and other mobile construction equipment could generate substantial amounts of fugitive dust, resulting in elevated PM_{10} concentrations. Wind and disturbance of exposed areas would also be sources of dust emissions. EPA studies have estimated uncontrolled construction related PM_{10} emissions at about 23 kilograms per acre per day (51 pounds per acre per day). These emissions can be reduced greatly through application of control measures. Emissions from construction activities would vary considerably by season and would be greatest during late spring through fall when ground disturbances usually occur. Typical winds at Ames Research Center during this time period are from the northwest. PM_{10} emissions from construction would potentially affect downwind receptors .

Removal of hazardous materials or contaminated soils during demolition could lead to emissions of toxic air contaminants. Buildings constructed prior to 1980 may include asbestos or lead containing materials. NASA is conducting lead and asbestos surveys on all buildings to be demolished. Demolition, renovations or removal of these materials is subject to BAAQMD and California Department of Toxic Substances Control regulations.

Combustion of diesel fuel from heavy-duty equipment and truck traffic associated with construction would result in significant emissions of nitrogen oxides. Construction activities would also result in significant PM_{10} emissions, primarily due to dust generation. The range of annual emissions of pollutants including particulates from construction activities ground disturbance, equipment exhaust, truck exhaust, and worker vehicle exhaust is shown in Table 4.4-11 , which anticipates a 10-year build-out period. Construction plans are not known at this time, so the predicted emissions in Table 4.4-11 should be considered preliminary as they would vary considerably depending on the amount and type of construction activities.

As shown in Table 4.4-11 , preliminary calculations indicate that construction activities associated with all of the alternatives would result in emissions that exceed BAAQMD significance thresholds for nitrogen oxides and PM_{10}, which are more stringent than federal emissions standards.

TABLE 4.4-11 **MAXIMUM ANNUAL AIR POLLUTANT EMISSIONS FROM CONSTRUCTION ACTIVITIES AND CONSTRUCTION WORKER TRAFFIC ASSUMING 10-YEAR BUILDOUT PERIOD**

	Air Pollutant Emissions in Metric Tons Per Year *(tons per year)*		
Project Scenario	**ROG**	**NO_x**	**PM_{10}**
Alternative 1		Baseline	
Alternative 2	7 (8)	106 (116)	120 (132)
Alternative 3	6 (7)	91 (100)	73 (88)
Alternative 4	8 (9)	127 (140)	137 (151)
Alternative 5	5 (6)	75 (82)	117 (129)
Mitigated Alternative 5*	17(19)	99(109)	140(154)
BAAQMD Thresholds	*14 (15)*	*14 (15)*	*14 (15)*

* Due to additional housing in Mitigated Alternative 5, the project would have an 11-year buildout For details see Section 5.4.

Particulate matter from diesel fuel combustion was identified by the California Air Resources Board in 1998 as a toxic air contaminant. Since construction activities associated with the NADP would occur over many years, the potential for exposure of sensitive- receptors (primarily on-site receptors) to unhealthy levels of diesel particulates exists. CARB has recently begun a public process of developing regulations for retrofitting in-use diesel engines to reduce diesel particulate emissions. Over the next few years, CARB plans to develop regulations that address off-road (e.g., construction equipment) diesel-fueled engines (CARB 2001).

The BAAQMD evaluates the significance of construction PM_{10} emissions based on the implementation of effective and comprehensive control measures rather than detailed quantification of construction emissions. NASA is adopting all of the BAAQMD mitigation measures for PM_{10} (through Mitigation Measure AQ-5a, below).

D. Impacts and Mitigation Measures

This section summarizes significant impacts identified in Section C, and proposes mitigation measures for each identified impact.

Impact AQ-1: Build out of the NASA Ames Development Plan would result in population and vehicle uses projections that are inconsistent with regional air quality planning, and in emissions of air pollutants from automobiles and construction equipment which would exceed significance thresholds established by the BAAQMD.

Applicable to: Alternatives 2 through 5, and Mitigated Alternative 5

Mitigation Measure AQ-1: The NADP includes a proposed TDM plan to reduce automobile trips from existing and planned uses. Even with the substantial reductions in vehicle trips projected in the TDM plan, emissions would remain above BAAQMD significance thresholds. This impact is significant and unavoidable.

Impact AQ-2: Without limits on the timing of construction, emissions of ozone precursors associated with combined construction and operation of the project could exceed 90,719 kilograms (100 tons) in any given year in which construction occurs. This would exceed the *de minimus* levels set forth in the Federal General Conformity Regulation and trigger the need for an additional conformity determination beyond the one proposed for carbon monoxide.

Applicable to: Alternatives 2 through 5, and Mitigated Alternative 5

Mitigation Measure AQ-2: NASA and its partners would schedule construction to ensure that annual emissions of ozone precursors associated with project construction and operation do not exceed a cumulative total of 100 tons per year. This would apply over all years of project construction and operation or until an applicable State Implementation Plan that includes the project emissions is approved by EPA. Implementation of this mitigation is mandatory to comply with the Federal Clean Air Act.

Impact AQ-3: Proposed laboratories and disaster training facilities would be a potential source of air pollutant emissions, including emissions of toxic air contaminants.

Applicable to: Alternatives 2 through 5, and Mitigated Alternative 5

Mitigation Measure AQ-3 : Prior to the issue of occupancy permits, operators of laboratories and disaster training facilities would be required to consult with the BAAQMD regarding possible permit requirements and emissions reduction equipment and to comply with BAAQMD's requirements.

Impact AQ- 4: Any long-term residential uses located over high concentrations of the Regional Plume would potentially be exposed to levels of air contaminants that present an adverse health risk.

Applicable to: Alternatives 2 through 5, and Mitigated Alternative 5

Mitigation Measure AQ- 4: Long-term residential uses would be avoided at areas located over high concentration zones of the Regional Plume in accordance with the Human Health Risk Assessment (HHRA) and EIMP.

Impact AQ-5: New proposed land uses under the NADP would be exposed to elevated levels of toxic air contaminants associated with the Regional Plume. This exposure could present a health risk.

Applicable to: Alternatives 2 through 5, and Mitigated Alternative 5

Mitigation Measure AQ-5: NASA would review all planned uses in light of the findings of the HHRA to ensure that planned uses would not create unacceptable public health risks. Proposed uses would be moved if unacceptable risks which could not be mitigated to an acceptable level were found.

Impact AQ-6: Construction emissions of PM_{10} associated with new development and renovation of existing facilities would result in potentially unhealthy air pollutant concentrations.

Applicable to: Alternatives 2 through 5, and Mitigated Alternative 5

Mitigation Measure AQ-6a: Measures to control dust generation would reduce this impact associated with PM_{10} to a level of less-than-significant. The following measures, including all control measures recommended by the BAAQMD, would be incorporated into construction contract specifications and enforced by NASA. These measures include the following provisions:

- Use reclaimed water on all active construction areas at least twice daily and more often during windy periods. Watering is the single-most effective measure to control dust emissions from construction sites. Proper watering could reduce dust emissions by over 75 percent.
- Cover all hauling trucks or maintain at least 0.6 meters (2 feet) of freeboard. Dust-proof chutes would be used as appropriate to load debris onto trucks during any demolition.
- Pave, apply reclaimed water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas, and staging areas at construction sites.
- Sweep daily (with water sweepers) all paved access roads, parking areas, and staging areas and sweep streets daily (with water sweepers) if visible soil material is deposited onto the adjacent roads.

- Hydro seed or apply (non-toxic) soil stabilizers to inactive construction areas (previously graded areas that are inactive for 10 days or more).
- Enclose, cover, water twice daily, or apply (non-toxic) soil binders to exposed stockpiles.
- Limit traffic speeds on any unpaved roads to 25 kilometers per hour (15 mph).
- Install sandbags or other erosion control measures to prevent silt runoff to public roadways.
- Replant vegetation in disturbed areas as quickly as possible.
- Install wheel washers for all exiting trucks, or wash off the tires or tracks of all trucks and equipment leaving the site.
- If necessary, install windbreaks, or plant trees/vegetative windbreaks at the windward side(s) of construction areas.
- Suspend excavation and grading activity when winds (instantaneous gusts) exceed 40 kilometers per hour (25 mph) and visible dust emission cannot be prevented from leaving the construction site(s).
- Limit areas subject to disturbance during excavation, grading, and other construction activity at any one time.
- Prior to disturbance (or removal) of materials suspected to contain asbestos, lead or other toxic air contaminants, contact the BAAQMD.
- NASA would designate an *Environmental Coordinator* responsible for ensuring that mitigation measures to reduce air quality impacts from construction are properly implemented. This person would also be responsible for notifying adjacent land uses of construction activities and schedule.

<u>Mitigation Measure AQ-6b</u>: Measures to reduce emissions of nitrogen oxides and particulate matter from diesel fuel combustion during construction should be evaluated and implemented where reasonable and

feasible. The following measures would reduce the impacts from construction fuel combustion:

— Properly maintain construction equipment. This measure would reduce emissions of ROG, NOx and PM_{10} by about 5 percent.

— Evaluate the use of available alternative diesel fuels and where reasonable and feasible, use alternative diesel fuels. *The CARB has verified reductions of NOx by almost 15 percent, and particulate matter by almost 63 percent, from use of alternative diesel fuels. However, the use of these fuels may not be appropriate for all diesel equipment*.

— Reduce construction traffic trips through TDM policies and implementation measures.

— Reduce unnecessary idling of construction equipment and avoid staging equipment near or upwind from sensitive receptors such as on-site residences or daycare uses.

— Where possible, use newer, cleaner burning diesel-fueled construction equipment. The *Environmental Coordinator* would prohibit the use of equipment that visibly produces substantially higher emissions than other typical equipment of similar size.

Impact AQ-7: Construction emissions associated with new development and renovation of existing facilities would result in potentially unhealthy air pollutant concentrations.

Applicable to: Alternatives 2 through 5, and Mitigated Alternative 5

Mitigation Measure AQ-7a: NASA would install air pollution devices, for example, particulate traps and oxidation catalysts, on construction equipment to the greatest extent that is technically feasible.

Mitigation Measure AQ-7b: NASA and its partners would develop and implement a Construction Emissions Mitigation Plan (CEMP) to ensure that the project would comply with the Federal Clean Air Act and further reduce emissions. The plan would include measures and procedures, sufficiently defined to ensure a reduction of nitrogen oxides, PM_{10}, and diesel particulate matter.

The CEMP would be developed in consultation with EPA and BAAQMD. The CEMP would be evaluated by NASA and its partners on an annual basis to schedule construction ensuring that emissions of ozone precursors associated with project construction and operation would not exceed 91 tonnes (100 tons) per year and update measures to include new rules or regulations. NASA and its partners would consult with the BAAQMD on an annual basis during project construction to determine if additional air quality mitigations to reduce the project's air quality impact are warranted, and to take such additional air quality mitigation as is appropriate and reasonable, and in an expeditious manner.

A CEMP coordinator, who would also act as a "Disturbance Coordinator" would be responsible for ensuring that measures included in the CEMP are implemented. This would be done through field inspections, records review, and investigations of complaints.

At a minimum, the CEMP would include the following measures to reduce emissions from construction activities:

— Require that all equipment is properly maintained at all times. All construction equipment working on site would be required to include maintenance records indicating that all equipment is tuned to engine manufacturer's specifications in accordance with the time frame recommended by the manufacturer.

— All construction equipment would be prohibited from idling more than 5 minutes.

— Tampering with equipment to increase horsepower would be strictly prohibited.

- Include particulate traps, oxidation catalysts and other suitable control devices on all construction equipment used at the site.
- Diesel fuel having a sulfur content of 15 ppm or less, or other suitable alternative diesel fuel, would be used unless such fuel cannot be reasonably procured in the market area.
- The CEMP would also ensure that construction-related trips are minimized through appropriate policies and implementation measures.
- The CEMP would address the feasibility on a biannual basis of requiring the use of reformulated or alternative diesel fuels.
- The CEMP Coordinator (or Environmental Coordinator) would prohibit the use of equipment that visibly produces substantially higher emissions than other typical equipment of similar size.
- The staging of three or more pieces of construction equipment near or just upwind from sensitive receptors such as residences or daycare uses would be prohibited.

<u>Mitigation Measure AQ-7c</u>: The CEMP would address the feasibility of requiring or encouraging the use of "Cleaner" (Lower Emissions) construction equipment on an annual basis. For larger construction projects (i.e. projects greater than 9,290 square meters (100,000 square feet)), a percentage of the equipment would be required to be 1996 or newer. This would be determined as follows:

- If equipment is leased by the contractor, then the percentage of 1996 or newer equipment would be maximized so that the total cost of leasing equipment would not exceed 110 percent of the average available cost for leased equipment.
- If equipment is owned by the Contractor, then the CEMP shall identify the minimum percentage of total horsepower for 1996 or newer equipment that should be used in construction. For the first year of construction, it shall be considered possible that 1996 or newer

equipment shall makeup a minimum of 75 percent of the total horsepower, unless NASA and its partners can show the BAAQMD that it is not reasonable.